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ABSTRACT

Brief general data describing tektite origins and locations of fields are given. The Czechoslovakian Vltavina field is discussed. Collections in the Prague National Museum (including Vrabce), Ceske-Budejovice (from Prof. J. Oswald), and others were detailed. History and description of the Trgebonsko-Budejovice depression are given. A brief closing statement on solar activity and atmospheric density is included.

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Only one aspect of the almost two-centuries old riddle of tektites has so far been resolved by the efforts of the scientists of various countries, and that is that the tektites are directly or indirectly associated with outer space. The tektites may be a special vitreous class of meteorites, products of meteoritic explosions and volcanic eruptions on the Moon and products of explosions on the Earth's surface produced by the impact of large cosmic bodies (asteroids and comets).

In this space age the tektites have attracted attention not only from a general theoretical point of view but also from the viewpoint of applied science. Engineers and scientists would like to know the composition, characteristics

*Numbers given in margin indicate pagination in original foreign text.

and age of the cosmic substance, the flight trajectories of the cosmic bodies, particularly those appearing as temporary Earth satellites, and under what conditions they drop to the Earth. That is why geologists and astronomers, chemists and mathematicians, and specialists in atomic energy and rocket flights are taking part in the researches.

Tektites are known to exist in every part of the world except the Antarctic region. They have been falling to the surface at various times, covering vast territories in the form of rains. There is one known region of tektite occurrence in Europe, and that is Czechoslovakia. Several tens of thousands of finds were made there in an area of 10,000 square kilometers, or rather in two areas--the South Czech and Moravian regions--about 50 km long each.

A systematic study of Vltavina-tektites[1] has been made in recent years by the national observatory (director: B. Polesni) of the Ceske-Budejovice oblast in southern Czechoslovakia. Using the members of the Young People's Astronomy Circle and the methodical assistance of the Committee on Meteorites of the /68 USSR Academy of Sciences, observatory scientist G. Shkrov organized three expeditions to "the mystery of the tektites" in 1962-1964. Two reports on these studies, authored by the entire circle, were published in the collection of articles under the title "Meteoritika" (meteoritics). In those three years the expeditions visited 56 deposits[2], 19 of which were discovered for the first

[1]"Vltavinas" is a local name for tektites found along the Vltava River. For more details on tektites see "The Earth and Universe," Zemlya i Vselennaya, No. 1, 1965.

[2]The term "deposit" is used here not in the usual geological sense, inasmuch as the tektites are not ores and do not always produce any local accumulations. They are named after the nearest inhabited point. There are about 100 such deposits in southern Bohemia and about 50 in Moravia.

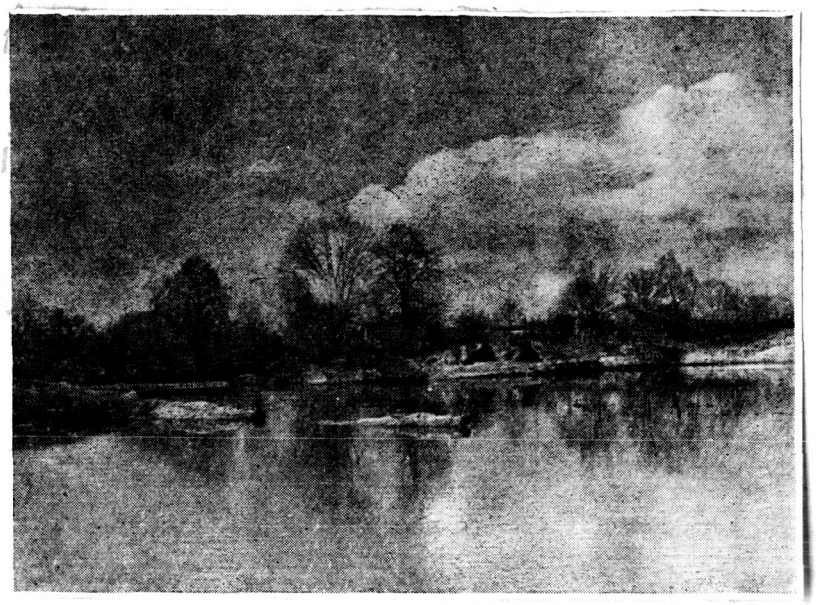
time, mapped 52 of them, collected 500 Vltavina-tektites and examined over 1,000 samples in other collections.

In the spring of 1965 I was invited by Shkrov to participate in the fourth expedition. The latter included 9 motor, pedestrian, railroad and mixed itineraries(starting from and returning to the town of Ceske-Budejovice): I, Gomole-Vrabce-Koroseki; II, Borshov-Golubov-Trjisov-Pleshovice-Cesky Krumlov; III, C. Vrbne-Gluboka-Grgejovice; IV, Mlade; V, Kamenni-Ujesd-Krasejovca-Dolni-Svince-Prostrgedni-Svince-Golkov-Kaplice-Vissi-Brod-Louczovice-N. Domki-Vissi-Brod-Roszmberk-Cesky Krumolv-Kamenni Ujesd; VI, Gomole-Vrabce-Slavce-Golubov-Klet-Zlata Koruna-Kosov-Kamenni Ujesd; VII, Veseli-Sobeslav-Tabor-Praha; VIII, Mlade-Stradjcovice-Trgove Svini-Nehov-Loczenice-Nesmen-Besednice-Loczenice-Mokri Lom-Roudne; IX, Borshov-Vrabce- Nova Gospoda-Slavce-Gabrzi-Lipi.

The expeditionary activity included a study of geomorphology, geology, stratigraphy and the soil cover in connection with the Vltavina-tektite finds, an inspection of the government and private collections, consultations with Czechoslovakian specialists, and lectures for local regional experts, geologists and astronomers.

The largest collection of tektites, numbering 15,000 specimens, is found in the National Museum of Prague. Such a well-known deposit as Vrabce is represented there by thousands of specimens. That collection was founded by engineer F. Ganus who had built sugar refineries in Russia and became one of the most popular tektite collectors in his old age. Dr. K. Tucec is currently studying and expanding that collection.

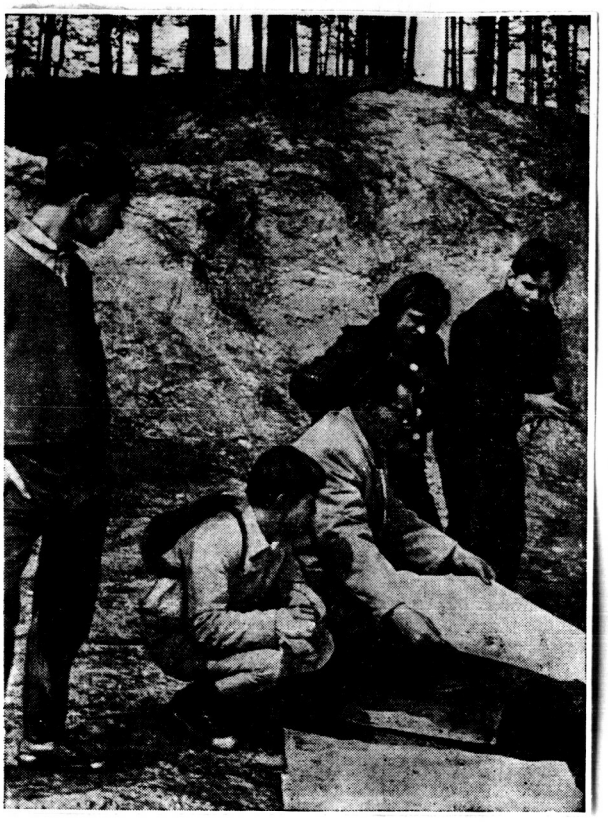
Prof. J. Oswald's private collection in Ceske-Budejovice, consisting of about 4,000 specimens, is among the largest. J. Oswald is the oldest investigator of tektites, and the founder and keeper of another interesting collection, the South-Czech regional museum.



The Mlada deposits in the suburbs of Ceske-Budejovice. The tektites are found in the sand quarry on the lake shore.

In Cesky Krumlov I had the opportunity to make a more detailed study of another large collection by J. Procopec, a lathe turner and head of the city astronomy circle, who had covered 4,500 km on his motorcycle in 54 days, visited 90 deposits and collected over 2,000 samples with some members of his circle /69 (1,500 of those samples were collected in 1964). He established a unique record in the Kosov-Milikovice area: 59 samples were found by two men in 2-1/2 hours.

This does not exhaust the list of collections available in the country; there is a total of 50 of them, according to G. Shkrov. To these should be added the several dozen unregistered collections. The other enthusiastic amateurs collecting or studying tektites include R. Shimon, doctor of law, who has made 30 trips to Moravia for that purpose, Dr. R. Rost of the Carlova university, Dr. J. Kocjan, a regional geologist and an expert in the geology of southern



G. Shkrov with the youngest members of the expedition, the members of the astronomy circle.

Czechia, Dr. D. Adamovsca, who dedicated herself to the study of the history of Vltavina-tektites, and the workers of the Louczovice cellulose and paper mill who initiated the casting of large telescope mirrors which are as good as the Zeiss products, and who are planning to study the tektites by the synthesis method, etc.

The information obtained by the fourth expedition, combined with the previous data, has made it possible to interpret some of the conditions characterizing the Czechoslovakian tektic rainfall in the tertiary period, that is, about 20 million years ago, and the eventual redistribution of the tektic substance.

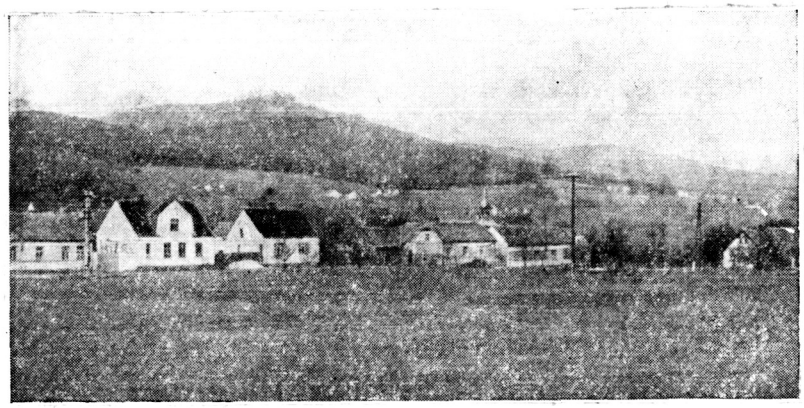
The Vrabce deposit area. We find tiny tektic fragments among the stones and fertilizer of the freshly plowed Nova-Gospoda field.

The tektic fallout area, it was found, covered a considerably larger territory than the area of the contemporary finds, several tens of thousands square kilometers. The tektic rain was not very heavy, and the distances between /70 the fallout specimens frequently amounted to dozens of meters. That territory was predominated by the geological destructive processes of the Bohemian-Moravian elevation, in the center of the fallout territory, as well as the neighboring elevated areas, and the washdown of the destruction products by water streams into the depressions. This washdown took place primarily on the western and eastern slopes of the massif. The Czech and Moravian Vltavina-tektites are somewhat different from one another in the frequency of the finds, color and shape which may be due to the changing tektic substance in the course of the flight and when it drops to the ground. The Vltavina-tektites, in turn, are

A small sand quarry. Tektite-bearing tertiary sands are found under a thin layer of quartenary sands. Far beyond the trees are the fields of the well-known Nesmen deposit.

different from the other territorial groups of tektites, which is indicative of their independent development.

The Trgebonsko-Budejovice depression which contains a lake and is shaped like a saddle was one of the main washdown areas. The rivers flowing into it carried tektites along with their sand and pebbles and deposited them in the lake. The layer of deposits on the bottom grew thicker with individual tektites distributed in it like raisins in a cake. Only the remotest and quietest spots of the lake bottom, not reached by the sand and pebble and covered with a fine silt, did not contain any tektites. The bottom gradually rose so high that the lake dried up. The small rivers flowing into the depression needed a new outlet. They combined into a common riverbed and found their runoff. That is how the Vltava River eventually came into being.

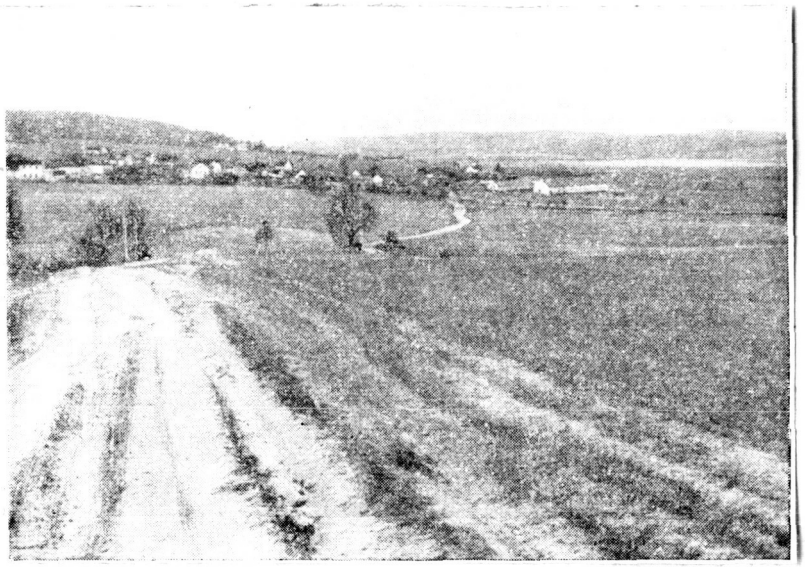


The rich Slavce tektite-bearing field at the edge of the Trgebonsko-Budejovice depression. Far in the background is the Kluk Mountain where the tektites are no longer found.

The geologists have been looking for a tektite-bearing stratum for a hundred years, hoping to find in it the key to the understanding of the nature of tektites. But no such stratum could possibly have existed. Tektites were found everywhere: there were many of them in the areas of swift water escapes, and fewer in other places.

Two huge fractures were produced along the rim of the depression during the so-called Alpine orogenic movement, and its internal part subsided forming a fault. Then, perhaps a million years later, these scraps were flattened and the subsident part remained unchanged. The tektites occurring outside the /71 fault area are found in the relict river and lake deposits or under the younger quaternary deposits.

Thus, the bottom specimens of every deposit may be "native," that is the ones that had originally dropped there, and all the upper ones may have been "brought" from one or many other places. Oswald, Prokopec and other local researchers propose this method of identifying the "native" tektites. The



The sand fields at Gabrgi. There are many more tektites in the sand, especially the red sand.

muricated samples usually contain some dirt which can easily be washed off; but such dirt cannot be washed off the bottom part of the "native" specimens because it had been "baked on" to the samples over a long period of time, or because the original tektite was hot when it first hit the ground and baked the soil under it. This is still only an assumption but a fairly reasonable one.

Were the "brought" samples affected by a long period in transit? The answer is yes. A study of the collections revealed that the tektites had acquired a dull lustre, a smoother surface and were reduced to fragments; when conditions were particularly unfavorable, they were transformed into regular, well-polished pebbles. All the three mentioned parameters are therefore closely interrelated. This was quite evident in the case of the Vracbe samples: the transported Gabrczi tektites were considerably smaller by comparison.

If a certain size of the samples, a certain degree of their surface preservation, and a certain lustre are typical of a deposit, it means that they

have covered the same transportation route. Such is the case of Slavce, for example. On the other hand, if the deposit has no specific characteristics of its own, containing specimens of different sizes, surfaces and lustre, it means that the area had been intersected by many routes (Koroseki).

The contemporary distribution of Czech tektites along the middle reaches of the Vltava iver is indicative primarily of the tertiary hydrography and morphology of the area. They occur in the low terrain in the sandy soil and sand quarries, or "piskarnyas," particularly where the sand takes on a red tint. Such finds are particularly facilitated by spring plowing, heavy rains and earthwork, and attract many amateurs to these places. The mineralogical composition of the soil is radically changed by the bedrock and crystalline rock along the edge of the depression, where the ground is higher, and the tektites disappear.

The close friendly relations between our countries and, especially, the invaluable assistance of the Czech school students contributed a great deal to the success of the expedition. The continuation and strengthening of that friendship will undoubtedly lead to new and still more valuable scientific achievements.

Solar Activity and Atmospheric Density

The Soviet researchers V. V. Mikhnevich, Ye. N. Golubev and Yu. N. Parfinovich have published the preliminary results of their efforts to determine the concentration of particles and atmospheric density on the basis of the measurements made by the high-altitude automatic geophysical station. The measurements were made on 18 June 1963, at 4:30 local time in the median latitudes of the European part of the USSR.

The high-altitude automatic geophysical station is a polished-metal sphere with a diameter of about one meter. Its overall weight, including the instruments, is about 360 kilograms. It is placed in the nosecone of a rocket. At a certain altitude the station separates from the rocket, becomes stabilized in the required position, rises to the apogee of the trajectory and then descends to an altitude of about 43 kilometers.

The facilities used in the experiment included the ionizing and magnetic electric-discharge manometers with amplifying instruments installed in the station.

The density distribution of the atmosphere found at altitudes above 200 kilometers suggests a certain relationship between the atmospheric density and solar activity: a diminution of solar activity is accompanied by a greatly reduced atmospheric density.

The effect of solar activity on the atmospheric density below 200 kilometers appears to be insignificant.